

CLAIMS

What is claimed is:

- 1 1. A tunable diffraction grating comprising:
 - 2 a cell with a first cell wall spaced from a second cell wall;
 - 3 electrodes disposed on facing surfaces of the first and second cell walls; and
 - 4 an array of nematic liquid crystal convective rolls, wherein said convective rolls
 - 5 are arranged periodically in space between said first cell wall and said second cell wall;
 - 6 and
 - 7 a polymeric network stabilizing said array of nematic liquid crystal convective
 - 8 rolls.
- 1 2. The tunable diffraction grating of claim 1, wherein the convective rolls are arranged with
 - 2 a grating constant approximately twice the separation distance between said first and
 - 3 second cell walls.
- 1 3. The tunable diffraction grating of claim 1, further comprising:
 - 2 a power source connected to said electrodes to apply an electric field, wherein said
 - 3 convective rolls are arranged with a structure factor, and said structure factor is adjusted
 - 4 by application of an electric field through said power source.
- 1 4. A method for producing a diffraction grating comprising the steps of:
 - 2 introducing a polymerizable mixture including nematic liquid crystal, dopant, and
 - 3 polymerizable precursor between two electrically conductive substrates;
 - 4 applying a potential difference across the polymerizable mixture to cause the
 - 5 nematic liquid crystal to assemble into an array of convective rolls; and
 - 6 stabilizing the convective roll structure by forming a polymer network from the
 - 7 polymerizable precursor, wherein the polymer network is templated by the convective
 - 8 roll structure.

1 5. The method according to claim 4, wherein the polymerizable mixture further includes
2 an initiator, said initiator being activated in said step of stabilizing to initiate the
3 formation of the polymer network from the polymerizable precursor.

1 6. The method according to claim 5, wherein the initiator is a photoinitiator and said step
2 of stabilizing includes photoinitiation of the photoinitiator.

1 7. The method according to claim 4, wherein said convective rolls are arranged with a
2 structure factor after said step of stabilizing, and the method further comprises, after said
3 step of stabilizing:
4 adjusting the structure factor by application of an electric field through at least one
5 of the electrically conductive substrates.